

U. S. Application No. 10/717,865
Attorney Docket No. 2003B005/2
Reply to Final Rejection of September 14, 2006
Response dated October 5, 2006

Please replace paragraph [0008] beginning on page 3, line 1 of the application as written with the following replacement paragraph:

Also described are processes of preparing a polymer composition that includes a diene-modified polypropylene random copolymer, which processes preferably include: contacting a metallocene catalyst compound having at least two indenyl rings or derivatives of indenyl rings, each ring being substituted at the 2 and/or 4 positions, with a polymerization medium that includes at least a propylene monomer and 2-methyl-1,5-hexadiene or an α , internal non-conjugated diene monomer that has an internal double bond comprising a di-substituted vinyl group or a tri-substituted vinyl group; and conducting polymerization of the monomers in the presence of the metallocene catalyst compound for a time sufficient to provide a diene-modified polypropylene random copolymer that includes monomeric units derived from each of the monomers, and having from 0.0 wt% to 2.0 wt% ethylene and a heat of fusion of 25 J/g or more, or 30 J/g or more.

Please replace paragraph [0009] beginning on page 3, line 13 of the application as written with the following replacement paragraph:

Also described are polymer compositions that include a diene-modified polypropylene random copolymer having propylene units; 2-methyl-1,5-hexadiene derived units or diene units derived from α , internal non-conjugated diene monomers; from 0.0 wt% to [[20]] 2.0 wt% ethylene units; and a heat of fusion of 25 J/g or more, or 30 J/g or more.

Please replace paragraph [0017] beginning on page 5, line 8 of the application as written with the following replacement paragraph:

The term "diene" is defined as a hydrocarbon compound that has two unsaturation sites, i.e., a compound having two double bonds connecting carbon atoms. Depending on the context, the term "diene monomer" in this patent refers broadly to either a diene monomer prior to polymerization, e.g., forming part of the polymerization medium, or a diene monomer after polymerization has begun (also referred to as a diene monomer unit or a diene monomeric unit).

U. S. Application No. 10/717,865
Attorney Docket No. 2003B005/2
Reply to Final Rejection of September 14, 2006
Response dated October 5, 2006

monomers, and having from 0.0 wt% to 2.0 wt% ethylene and a heat of fusion of 25 [J/g] or more, or 30 J/g or more, 50 J/g or more, or 70 J/g or more in some embodiments.

Please replace paragraph [0045] beginning on page 11, line 26 of the application as written with the following replacement paragraph:

Also described are processes of preparing a polymer composition that includes a diene-modified polypropylene random copolymer, which processes preferably include: contacting a metallocene catalyst compound having at least two indenyl rings or derivatives of indenyl rings, each ring being substituted at the 2 and/or 4 positions, with a polymerization medium that includes at least a propylene monomer and 2-methyl-1,5-hexadiene monomer or an α , internal non-conjugated diene monomer that has an internal double bond comprising a di-substituted vinyl group or a tri-substituted vinyl group; and conducting polymerization of the monomers in the presence of the metallocene catalyst compound for a time sufficient to provide a diene-modified polypropylene random copolymer that includes monomeric units derived from each of the monomers, and having from 0.0 wt% to 2.0 wt% ethylene and a heat of fusion of 30 J/g or more, and a Branching Index of 1.0 or less, 0.95 or less, 0.90 or less or 0.80 or less.

Please replace paragraph [0049] beginning on page 12, line 18 of the application as written with the following replacement paragraph:

In one or more of the processes described herein the diene is 2-methyl-1,5-hexadiene or an[[, the]] α, internal non-conjugated diene monomer, ~~can include 2-methyl-1,5-hexadiene or such as~~ 7-methyl-1,6-octadiene.

Please replace paragraph [0063] beginning on page 20, line 1 of the application as written with the following replacement paragraph:

In one or more embodiments described herein, the propylene copolymers have a Branching Index of 1.0 or less, or 0.98 or less, or ~~[[.95]]~~ 0.95 or less, or 0.90 or less, or 0.80 or less.

U. S. Application No. 10/717,865
Attorney Docket No. 2003B005/2
Reply to Final Rejection of September 14, 2006
Response dated October 5, 2006

Please replace paragraph [0064] beginning on page 20, line 5 of the application as written with the following replacement paragraph:

As mentioned above, certain embodiments of this invention relate to a copolymer composition. In one or more specific embodiments, this invention is directed to a copolymer composition that includes crosslinkable diene-modified polypropylene random copolymer having propylene units; 2-methyl-1,5-hexadiene derived units or diene units derived from α , internal non-conjugated diene monomers; from 0.0 wt% to [[20]] 2.0 wt% ethylene units; and a heat of fusion of 25 J/g or more or 30 J/g or more.

Please replace paragraph [0065] beginning on page 20, line 11 of the application as written with the following replacement paragraph:

In one or more of the polymer compositions described herein, the diene units derived from 2-methyl-1,5-hexadiene monomers or α , internal non-conjugated diene monomers are present in the polypropylene copolymer in an amount of from 0.0005 mol% to 10 mol% or, in another specific embodiment, from 0.005 mol% to 1 mol%.

Please replace paragraph [0066] beginning on page 20, line 15 of the application as written with the following replacement paragraph:

In one or more of the polymer compositions described herein, the diene monomer is 2-methyl-1,5-hexadiene or the α , internal non-conjugated diene monomer is selected from the group consisting of 2-methyl-1,5-hexadiene and 7-methyl-1,6-octadiene 7-methyl-1,6-octadiene.

Please replace paragraph [0067] beginning on page 20, line 18 of the application as written with the following replacement paragraph:

In one or more of the polymer compositions described herein, the propylene copolymer has a crystallization temperature (T_c) of 25 °C or more. Alternatively, the

U. S. Application No. 10/717,865
Attorney Docket No. 2003B005/2
Reply to Final Rejection of September 14, 2006
Response dated October 5, 2006

It is further contemplated that the diene monomers, 2-methyl-1,5-hexadiene and/or the α , internal non-conjugated diene monomers, form side chain unsaturation sites in the polypropylene main chain. It is contemplated that the α -double bond of the α , internal non-conjugated diene monomers is polymerized by the metallocene catalyst system at a rate comparable with propylene polymerization while the internal bond of the α , internal non-conjugated diene monomers is incapable, or less capable, of polymerization by the metallocene catalyst system at a rate comparable with the propylene polymerizations. It is further contemplated that the substituents of the internal double bond sterically hinder polymerization by the metallocene catalyst of the internal double bond. Preferably, the side chain unsaturation sites enable the polymer to be cross-linked through exposure to radiation, heat, or cross-linking agents (i.e., peroxides[[]]). Cross-linking of the polymer through the side chain unsaturation sites derived from α , internal non-conjugated dienes provides H-type branching.

Please replace paragraph [00135] beginning on page 84, line 10 of the application as written with the following replacement paragraph:

At the reactor outlet valve the pressure drops to begin the separation of polymer and unreacted monomer, co-monomers, propane, etc. The temperature in this vessel is typically maintained above the polymer product's crystallization point but the pressure may be below the critical point. The pressure need only be high enough that the propylene can be condensed against standard cooling water. The liquid recycle stream can then be recycled to the reactor with a liquid pumping system instead of the hyper-compressors required for [[Polyethylene]] polyethylene units. The relatively low pressure in this separator will reduce the monomer concentration in the liquid polymer phase which will result in a much lower polymerization rate. This polymerization rate may be low enough to operate this system without adding a catalyst poison or "killer[[]]". If no poison is added to the system then the recycle stream will not require treating before it can be fed back to the reactors. If, however, a catalyst killer is required (e.g., to prevent reactions in the high pressure recycle) then provision is preferably made to remove any potential catalyst poisons from the recycled propylene rich monomer stream, e.g., by the use of fixed bed absorbents or by scavenging with an aluminum alkyl.

U. S. Application No. 10/717,865
Attorney Docket No. 2003B005/2
Reply to Final Rejection of September 14, 2006
Response dated October 5, 2006

Please replace paragraph [00136] beginning on page 84, line 27 of the application as written with the following replacement paragraph:

Alternatively, the HPS may be operated over propylene's critical pressure but within the propylene/polypropylene two phase region. This is an economically preferred method if polypropylene is to be produced with a revamped high pressure polyethylene ("HPPE") plant. The recycled HPS overhead is cooled and dewaxed before being returned to the suction of the secondary compressor, which is typical of HPPE plant operation.

Please replace paragraph [00139] beginning on page 85, line 10 of the application as written with the following replacement paragraph:

Industrially a loop reactor is not operated at the high pressures encountered in autoclaves and tubes. One version of the [[PP]] polypropylene process operates in a supercritical region but below the cloud point curve of the polymer and at temperatures below the polymer crystallization point. Thus the polymer is present as a slurry with the temperature below the melting point of the polymer to avoid fouling deposition of polymer on the wall thereby reducing heat exchange.

Please replace paragraph [00144] beginning on page 86, line 4 of the application as written with the following replacement paragraph:

Propylene and higher olefins are far less susceptible to temperature runaway and explosive decomposition than ethylene, so potentially a higher maximum reactor operating temperature can be tolerated but within the limits of catalyst activity, molecular weight and ~~[[isotacticity]] isotacticity~~ requirements of the products.

Please replace paragraph [00153] beginning on page 87, line 30 of the application as written with the following replacement paragraph:

PAGE 13/30 * RCVD AT 10/5/2006 3:53:00 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-2/15 * DNIS:2738300 * CSID:281 834 1231 * DURATION (mm-ss):09-08